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In re Application of:

Docket No.: 1997DE403 C/CIP

DEC 05 2003

KRULL et al.

Serial No.: 09/788,261

Group Art Unit: 1714

Filed: September 18, 2001

Examiner: Medley, Margaret B.

For: FUEL OILS BASED ON MIDDLE DISTILLATES AND COPOLYMERS OF
ETHYLENE AND UNSATURATED CARBOXYLIC ACIDS

OFFICIAL

DECLARATION UNDER 37 C.F.R. §1.132

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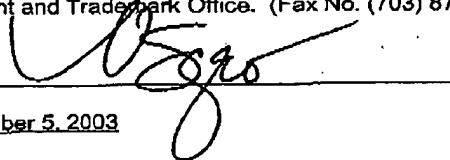
Dear Sir:

Applicants provide the following declaration evidence of Dr. Matthias Krull, co-inventor of the above-identified application for the purpose of traversing the rejection of claims 1 - 17 under 35 U.S.C. §103(a) as being unpatentable over European Patent 0 217 602 in view of WO-95/23200 and further in view of US-5 254 652.

This declaration provides objective evidence of unexpected results in the claimed invention to a fuel oil with improved cold flow properties, set forth in detail in the claims and taught in the present specification.

CERTIFICATE OF MAILING/TRANSMISSION (37 CFR 1.8a) and 1.10

I hereby certify that this correspondence is, on the date shown below, being transmitted by facsimile to the U.S. Patent and Trademark Office. (Fax No. (703) 872-9306[Group 1714] (6 pages)

Vicki L. Sgro: 

Date: December 5, 2003

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Application No.: 10/788,261
Filed: 9/18/2001
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I, Dr. Matthias Krull, am co-inventor of present Application Serial No. 10/788,261 as shown by the signed oath of record in this case. I have obtained the degree of Dr. rer. nat. (corresponds to Ph. D.) from the Free University Berlin, Germany, in 1989. I have been employed for 13 years in the Research and Development department of Hoechst AG, Frankfurt, Germany, which was succeeded by Clariant GmbH, Frankfurt, Germany, where my work has focused on oilfield chemicals and especially on cold flow additives for mineral oils.

I declare the following:

From my experience in the field of cold flow additives for mineral oils like fuel oil and diesel, a persistent problem occurs to researchers in the search for cold flow improvers for difficult to treat fuel oils. Such difficult to treat fuel oils according to the present invention are fuel oils having a cloud point of less than -8°C , a boiling range (90 -20 %) of less than 120°C , a 95 % distillation point of less than 350°C and a difference between the cold filter plugging point and the pour point of less than 10°C .

For the sake of clarity, the following remarks appear to be appropriate to me.

All middle distillates contain linear paraffins, which crystallize upon cooling. When an oil is cooled down, these paraffin crystals begin to grow until they cause filter plugging (cold filter plugging point), and upon further cooling they form an interlocking network which prevents flow (pour point).

The cloud point of an oil is the temperature at which the oil becomes opaque because of the beginning precipitation of paraffins.

The cold filter plugging point of an oil is the temperature below cloud point where the amount of precipitated paraffins becomes sufficient to plug a standardized fuel filter.

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The pour point is the temperature below cold filter plugging point where the amount of precipitated paraffins is sufficient to inhibit the oil from flowing completely, i. e. the oil becomes essentially solid.

In general, the temperature difference between cloud point and cold filter plugging point of an untreated fuel is small, e. g. 1 to 4°C. The temperature difference between cold filter plugging point and pour point is considerably higher, usually larger than 10°C.

Under arctic conditions, special oils are required. These oils have low amounts of long chain paraffins with more than 26 carbon atoms. This results in a low cloud point, low 95 % distillation point, and a low (90 – 20%) distillation range.

Caused by the low content of long chain paraffins, the paraffin chain length distribution of the remaining paraffins is narrowed. The narrow paraffin chain length distribution results in 2 effects:

1. Paraffins with like chain lengths crystallize more readily.
2. Paraffins with like chain lengths crystallize at similar temperatures.

These effects cause the paraffins to precipitate at a narrow temperature range below cloud point or cold filter plugging point respectively. Conventional cold flow improvers cannot cope with this large amount of paraffins precipitating in a narrow temperature range.

The following experiments were conducted under my supervision to test the effectiveness of the copolymers investigated for improving the flow properties described with reference to the "cold filter point plugging test" (cold filter plugging point). The test was carried out in accordance with European Industrial Standard

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EN116. A detailed description of the essential methods followed in the experimental procedures is set forth below.

The instant invention relates to a fuel oil having a cloud point of less than -8°C. It is the objective of the present declaration to show that this limitation of instant claim 1 is material to the instant invention.

In order to show that the cloud point limitation is material, 5 copolymers have been tested as to their effectiveness for lowering the cold filter plugging point of two different oils.

3 of the copolymers are copolymers meeting the limitations of instant claim 1. These copolymers are designated A2, A4 and A5 in accordance with the examples' section of the instant patent application as originally filed.

2 of the copolymers are copolymers not meeting the limitations of instant claim 1. These copolymers are comparative copolymers, they are designated V1 and V2 in accordance with the examples' section of the instant patent application as originally filed.

The properties of the additional two test oils used are given in Table 1. Test oil 7 has a cloud point of -5°C and a difference (cold filter plugging point) – (pour point) of 37°C. Test oil 8 has a cloud point of -5°C. Both Test oils therefore do not meet the limitations of instant claim 1. Both Test oils are comparative test oils to be compared with the Test oils of the examples' section of the instant patent application as originally filed. The test oils 7 and 8 are similar to the oils used in WO-95/23200. The test oils 7 and 8 differ from the test oils used in EP 0 217 602 A1 in the Pour Point (the pour point is considerably lower in Test oils 7 and 8) and the 90% and 95% boiling points are lower than in EP 0 217 602 A1.

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Table 1: Properties of Test oils 7 and 8

| | Test oil 7 | Test oil 8 |
|--|-------------------------|-------------------------|
| Initial boiling point | 219°C | 165°C |
| 20 % | 270°C | 256°C |
| 90 % | 334°C | 336°C |
| 95 % | 345°C | 348°C |
| Final boiling point | 357°C | 360°C |
| Cloud Point | -2°C | -5°C |
| cold filter plugging point | -5°C | -8°C |
| Pour Point | -42°C | -12°C |
| (cold filter plugging point) – (pour point) | 37 | 4 |
| Density | 0.874 g/cm ³ | 0,832 g/cm ³ |

The copolymers A2, A4, A5, V1 and V2 are characterized as follows:

- A2: Ethylene-vinyl neodecanoate copolymer containing 7 mol% of vinyl neodecanoate and having a V_{140} of 200 mPa·s.
- A4: Ethylene- vinyl neoundecanoate copolymer containing 7 mol% of vinyl neoundecanoate and having a V_{140} of 84 mPa·s.
- A5: Copolymer of ethylene and 8 mol% of stearyl acrylate, having a V_{140} of 65 mPa·s.
- V1: ethylene-vinyl acetate copolymer containing 13.3 mol% of vinyl acetate and having a melt viscosity V_{140} of 125 mPa·s

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V2: ethylene-vinyl acetate-vinyl neodecanoate terpolymer containing 16 mol% of vinyl acetate and 1.2 mol% of vinyl neodecanoate and having a melt viscosity V_{140} of 140 mPa·s

The melt viscosity V_{140} of the copolymer is determined according to ISO 3219 using the plate-and-cone measuring system at 140°C.

The efficiency of copolymers A2, A4, A5, V1 and V2 in lowering the cold filter plugging point of Test oils 7 and 8 has been determined at various concentrations. The obtained results are shown in Table 2.

Table 2: cold filter plugging point efficiency of copolymers

| copolymer | Test oil 7 | | | Test oil 8 | |
|-----------|------------|----------|----------|------------|----------|
| | 500 ppm | 1000 ppm | 2000 ppm | 500 ppm | 1000 ppm |
| A2 | - 7°C | - 8°C | - 7°C | | |
| A4 | | | | - 9°C | - 10°C |
| A5 | - 6°C | - 7°C | - 7°C | | |
| V1 | - 7°C | - 11°C | - 14°C | | |
| V2 | - 6°C | - 12°C | - 15°C | - 10°C | - 17°C |

The results show that the copolymers A2, A4 and A5 when used in oils that do not meet the limitations of instant claim 1 are considerably less effective than conventional ethylene/vinyl acetate copolymers. On the contrary, in oils meeting the limitations the copolymers A2, A4 and A5 with long side chain comonomers show superior cold filter plugging point performance. Attention is directed to Table 3 in the examples' section of the instant patent application as originally filed.

It is my opinion that these results obtained according to the compositions of the present invention were surprising.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signed



Printed Name

Dr. Matthias Krull

Date

25. NOVEMBER 2003

S. 1

* * * SENDEBERICHT (25.NOV.2003 9:52) * * *

TTI CLA FFM BUB/R&D 069/303299

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: SAMMELÜBERTRAGUNG
M : SPEICHER
S : STANDARD-AUFLÖSUNGC : VERTRAULICH
L : SPÄTER SENDEN
D : DETAIL-AUFLÖSUNG\$: TRANSFER
@ : NACHSENDEN
L : FEIN-AUFLÖSUNGP : ABRUF
E : ECM-FEHLERKORREKTUR
> : VERKLEINERUNG